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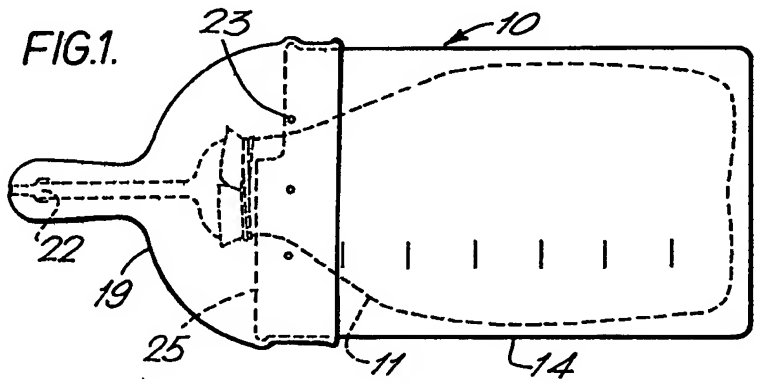
(54) **Baby's feeding apparatus**

(57) Embodiments of baby's feeding apparatus designed for use with babies with poor sucking ability, and vomiting babies are described. The apparatus in each case comprises a generally rigid generally cylindrical member 10 defining a fixed volume. The apparatus has an arrangement, e.g. a collapsible bag 11, allowing the introduction of a selected initial volume of feed within this fixed volume. The apparatus includes a mouthpiece suitable for reception in a baby's mouth and being so configured as in use to allow passage therethrough of feed from the initial volume. An arrangement is provided, e.g. holes 23, for allowing the introduction of air into the fixed volume. The apparatus further includes an arrangement which is controllable by the mother independently of the baby and allows regulation of the flow of feed, e.g. by squeezing the fexible body of the mouthpiece as in Figure 6.

FIG.1.



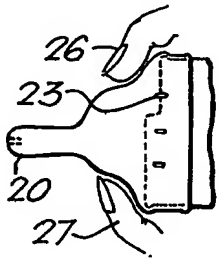


FIG.6.

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The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

FIG.1.

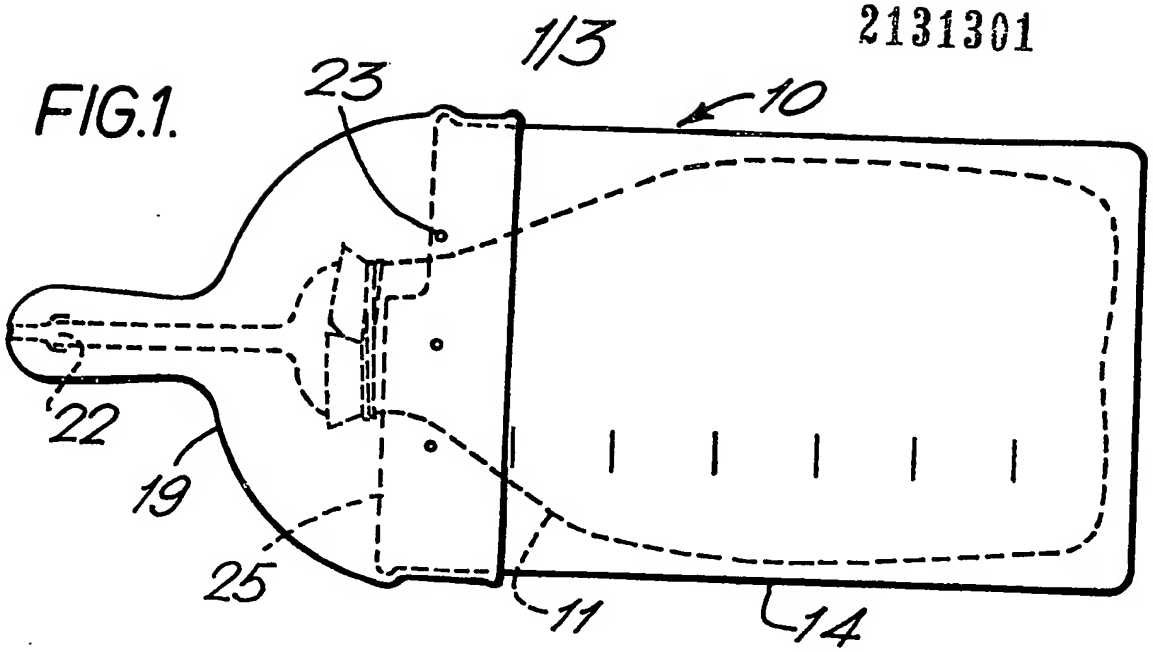


FIG.2.

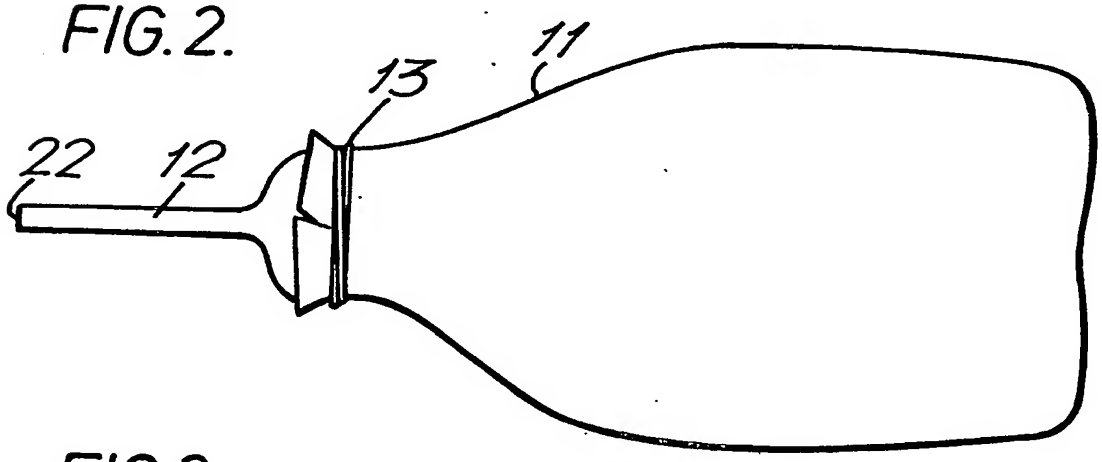


FIG.3.

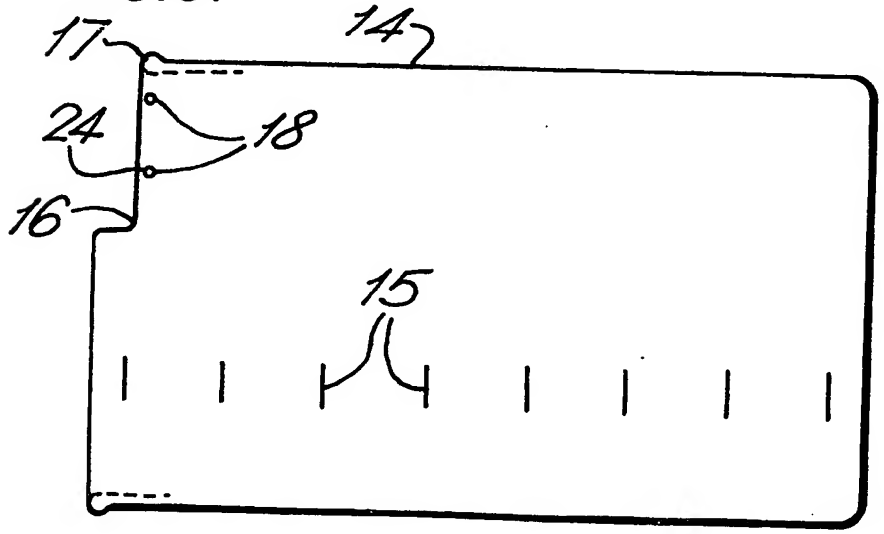


FIG.4.

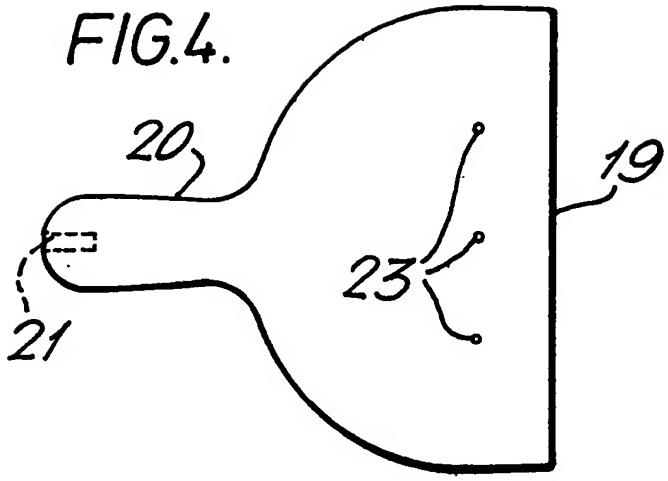
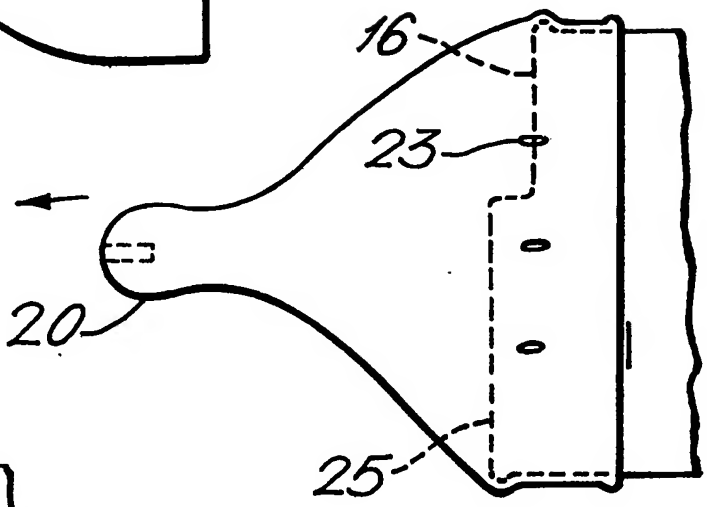


FIG.5.



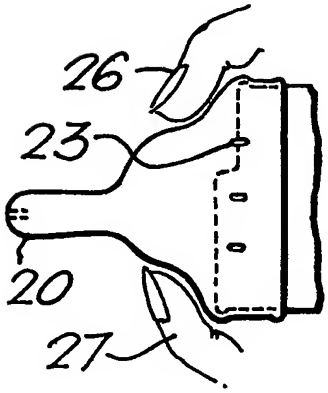


FIG.6.

FIG.7.

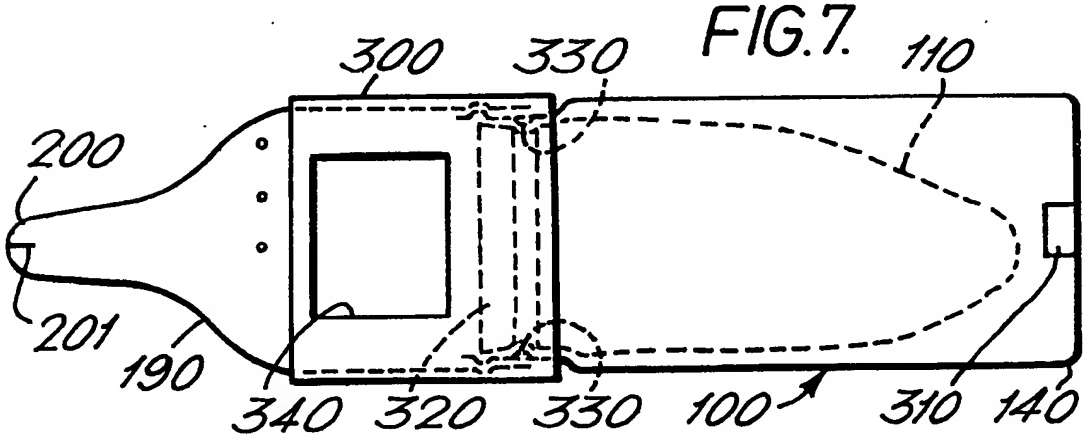


FIG.8.

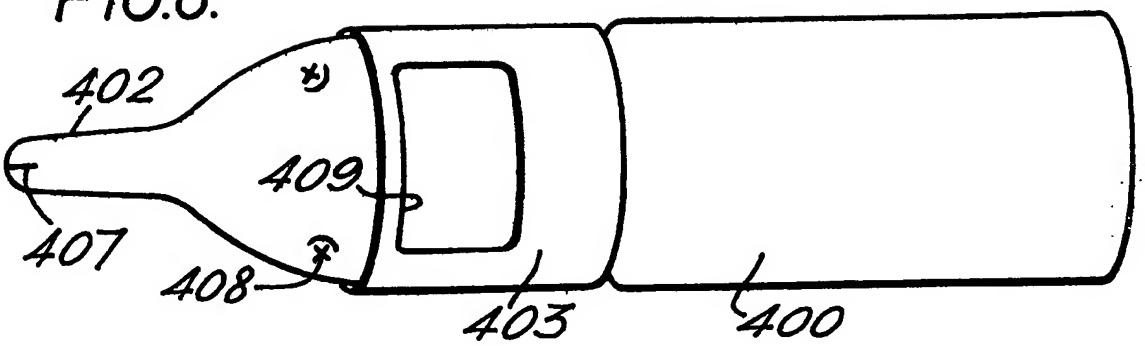


FIG.9.

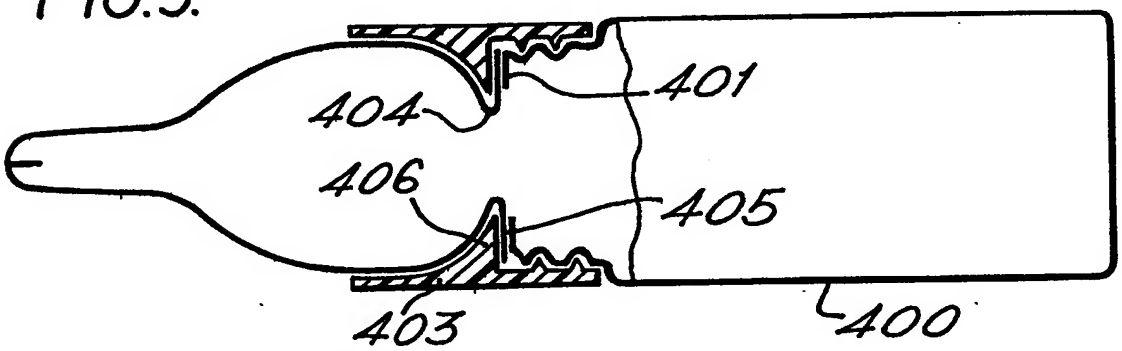
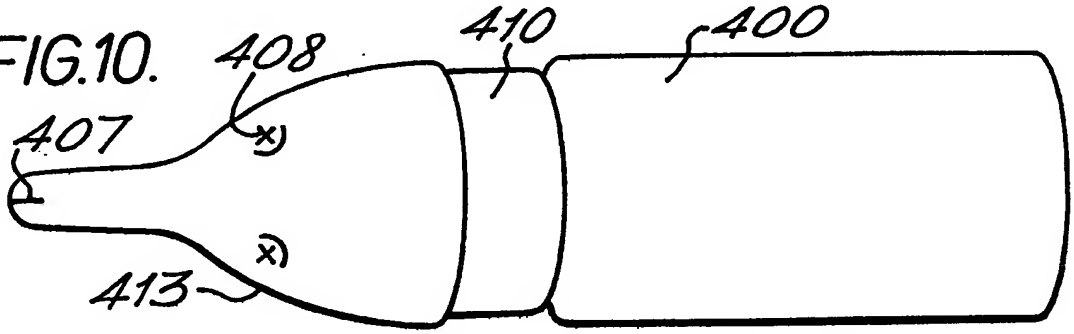


FIG.10.



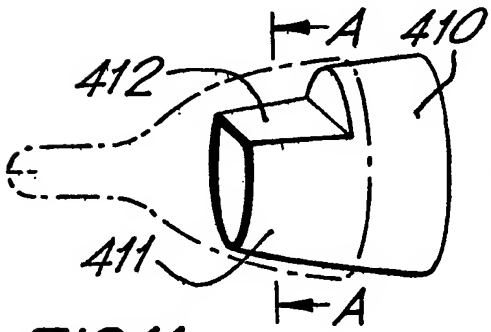


FIG.11.

FIG.12.

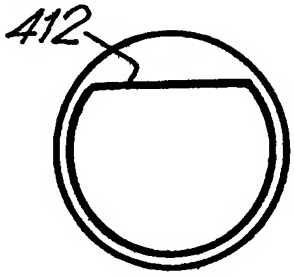
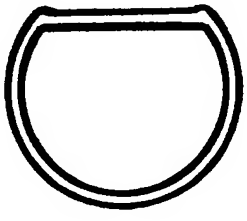


FIG.13.



SPECIFICATION

Baby's feeding apparatus

This invention relates to feeding apparatus for babies with poor sucking ability, and vomiting babies.

More babies suffer from poor sucking ability at some time in their early lives than might at first be supposed. Poor sucking ability is found amongst postoperative and sleepy babies; babies with neurological abnormalities, including cerebral palsy; dysautonomia; physically and mentally handicapped babies and children; babies born with mouth abnormalities such as cleft lip, cleft palate, etc; babies weakened by illness and borderline premature babies. Vomiting babies require thickened feeds, e.g. babies with hiatus hernia.

The present invention has arisen out of the problems which I encountered in attempting to employ the conventional oral feeding methods with a Pierre Robin Syndrome Baby. I found that bottle feeding was very slow with little or no success regardless of the type of teat used. The baby quickly grew frustrated and tired. Thickened feeds could be sucked only with difficulty through conventional teats and the various cleft palate teats as enlarging the teat opening resulted in uncontrolled milk flow. Attempts to feed the baby by spoon were also not very successful. The baby fretted and often gagged. Feeding proved a battle for the baby and for me. Spoon feeding is especially messy; and due to the frequent spills the actual intake by the baby could only be roughly estimated.

In accordance with a first aspect of the present invention, I provide a baby's feeding apparatus, comprising: a generally rigid generally cylindrical member defining a fixed volume; means allowing the introduction of a selected initial volume of feed within said fixed volume; a mouthpiece suitable for reception in a baby's mouth and being so configured as in use to allow passage therethrough of feed from said initial volume; means allowing the introduction of air into said fixed volume; and means controllable by the mother independently of the baby for regulating the flow of feed.

For convenience, the term "mother" is used throughout this specification to indicate the person feeding the baby. No particular significance is to be attributed to the choice of the word "mother"; this term where appropriate being intended to include, for example, both "father" and "nurse".

In the arrangements described below, the means whereby the mother may regulate the flow of feed independently of the baby is provided on the mouthpiece. I have found this particularly convenient in use since it enables the mother to apply the desired control while holding the bottle with the same hand and supporting the baby with her free hand. Additionally control is more sensitive to the baby's response when applied to the mouthpiece.

The means allowing the introduction of air into the fixed volume is desirably spaced from the means whereby the mother may regulate the flow of feed independently of the baby. This ensures unobstructed introduction of air while at the same time allowing the mother the desired degree of control of feed passing to the baby. The air introduction means may be provided as a non return valve on the bottle or, more preferably, by a valve integrally moulded or otherwise formed in the mouthpiece. This latter arrangement is particularly desirable in that it allows for the possibility where the mouthpiece and/or coupling means therefor are appropriately configured, for a standard wide-mouthed infants' feeding bottle to be employed, with only a special teat or mouthpiece being required.

In the preferred arrangement, the mouthpiece includes a teat end adapted to be received in a baby's mouth in use and a region of sufficient extent and flexibility as to be palpable by hand by the mother, thereby to provide the said means whereby the mother may regulate the flow of feed independently of the baby. In the most preferred arrangement the apparatus includes means which have the effect of limiting the maximum volume of feed in each palpation.

In a second and alternative aspect of my invention, I provide a baby's feeding apparatus, comprising: a generally rigid generally cylindrical member closed at one end and defining a fixed volume; means allowing the introduction of a selected initial volume of feed within said fixed volume; a mouthpiece suitable for reception in a baby's mouth and being so configured as in use to allow passage therethrough of feed from said initial volume, said mouthpiece being mounted at the other end of said cylindrical member; valve means allowing the introduction of air into said fixed volume whereby to equalize pressure therewithin as feed passes into the baby's mouth; and said mouthpiece comprising a teat end adapted to be received in a baby's mouth in use and a region of sufficient extent and flexibility as to be palpable by hand by the mother, whereby to provide a means controllable by the mother independently of the baby for regulating the flow of feed.

The invention is hereinafter more particularly described by way of example only with reference to the accompanying drawings, in which:-

Figure 1 schematically illustrates an embodiment of apparatus in accordance with this invention;

Figures 2,3 and *4* respectively illustrate the variable volume chamber, outer casing and mouthpiece of the embodiment of Figure 1;

Figure 5 is a view of the outer casing and mouthpiece useful for explaining how flow of feed may be regulated;

Figure 6 is a partial schematic view on a reduced scale showing how the flow of feed may be controlled by the mother;

Figure 7 schematically illustrates a second embodiment of apparatus in accordance with the present invention;

Figure 8 is a perspective view from one side illustrating a further embodiment of baby's feeding apparatus constructed in accordance with the present invention;

Figure 9 is a longitudinal sectional view through the apparatus of Figure 8;

Figure 10 is a generally perspective view of yet

another embodiment of apparatus in accordance with the present invention, and that which I presently prefer;

Figure 11 is a perspective view illustrating the cooperation between the mouthpiece and the collar of the embodiment of Figure 10; and

Figures 12 and *13* are axial sectional views taken along the lines A-A in Figure 11 illustrating the effect of applying manual pressure to the mouthpiece in a palpable region thereof.

The apparatus of Figures 1 to 6 is embodied as a feeding bottle and is suitable both for simple milk feeds and also for thickened feeds and for first stage solid feeds, all of which are included within the term "fluid feeds" as used herein.

The feeding bottle, generally indicated 10 comprises a collapsible bag 11 which is attached to a spout or nozzle 12 suitably by means of a tight band 13 as shown in Figure 2. In use the collapsible bag 11 is mounted within an outer casing 14 shown in Figure 3. The casing 14 is suitably formed from a rigid plastics material or from glass, with fluid measure markings 15 along its length. Mouth 16 of casing 14 is formed with a circumferential thickened rim 17 for a purpose to be explained below, and with locating means preferably in the form of a plurality (in this embodiment 3, though only two can be seen in Figure 3) of positioning indicia 18. In the illustrated embodiment these indicia consist of dots marked on the exterior of casing 14 adjacent the rim. As shown in Figure 3, mouth 16 projects further in the axial direction of casing 14 over part of its circumference than the remainder, for a reason which will become apparent hereafter. Indicia 18 are formed adjacent the rim on the part which does not project in this fashion.

The wide mouth of casing 14 is provided with a closure in the form of mouthpiece 19 which is suitably formed of soft latex rubber or from a plastics material with similar properties, and includes an integrally formed teat-end 20 with a through opening 21 provided by means of a re-entrant capillary tube of approximately 2mm diameter. A plurality of air holes 22 (here three in number) are a little larger than pin hole size, but still small enough such that when the material of mouthpiece 19 is relaxed, as in Figure 4, the air holes are effectively closed. It is to be understood that a variety of different mouthpieces 19 may be provided with different configurations of teat-end suitable for babies possessing different disadvantages.

In use, collapsible bag 11 is first filled with the fluid feed and is then secured to spout or nozzle 12 by means of the tight band 13. The filled bag with the spout attached is then lowered through the open mouth of casing 14 to fit snugly therein as shown in Figure 1. As much as possible of any air entrapped within the bag 11 is expelled, since otherwise it may be ingested by the baby giving it wind, and the distal end 23 of spout 12 is fitted onto the inner end of capillary tube 21. Mouthpiece 19 is stretched over rim 17 of mouth 16 with one or more of air holes 22 aligned with indicia 18, the spacing between indicia 18 and between air holes 22 when stretched over the open mouth of casing 14 being the same.

The thickened rim 17 with which mouth 16 of casing 14 is provided and the fact that the relaxed diameter of mouthpiece 19 is less than the diameter of casing 14 ensures that an airtight seal is achieved when the bottle head is in position. As shown in Figure 1, only a first air hole 23 is aligned with the first 24 of the indicia. As will be clear from what follows, if one hole is aligned with one of the indicia as in Figure 1, a gentle flow of feed results; if two of the holes are aligned with respective indicia, a medium flow of feed results; and if all three holes are aligned with the respective three indicia, then a fast flow of feed will result.

In the arrangement of Figure 1, hole 23, though tightly closed, is close to the rim of casing 14. The remaining two holes fall well behind the projecting edge 25. With the mouthpiece 19 placed in the baby's mouth, the mother can readily control the flow of feed. In time with the baby's sucking and swallowing movements such as they are, the mother palpitates the body of the mouthpiece with thumb 26 and forefinger 27 as shown in Figure 6. In so doing, air hole 23 is stretched open and across the adjacent edge of the rim 17. This lets in air to the otherwise airlocked interior of the feeding bottle and allows the bag 11 to collapse ejecting some feed into the baby's mouth via nozzle 12 and capillary tube 21. For an increased flow of feed, mouthpiece 19 is fitted to casing 14 so that two, or three of the holes are aligned with the indicia, and so that two, or three, as the case might be air holes are opened as the mother palpitates mouthpiece 19.

Should the baby itself suck sufficiently, the air holes will similarly be stretched open, as in Figure 5 allowing in air so that the bag 11 collapses ejecting a small quantity of feed into the baby's mouth with each suck. When the baby releases tension on the mouthpiece at the end of each sucking movement, mouthpiece 19 will relax again and the air hole or air holes will close shutting off the flow of feed until the air holes are again opened.

The rate at which feed flows is related to the size and to the number of air holes as well as to the size of the capillary 21 whilst the quantity delivered may be controlled by the mother by the speed of each palpitation. If the number of holes opened is increased, the rate, and consequently also the volume, of the feed flow per palpitation is increased.

It is not necessary that the positioning means comprise indicia 18 equal in number to the number of air holes 22. The positioning means may consist of, for example, a positioning line. In a modified arrangement the bottle may be provided with a rotatable ring as its exterior to which mouthpiece 19 is coupled in use, the ring being rotated together with mouthpiece 19 to select the desired feed flow rate. The arrangement must be airtight.

The embodiment of feeding apparatus described hereinabove with reference to Figures 1 to 6 posesses a number of valuable advantages. It is operable both by the mother and by the baby, either independently or simultaneously. By responding to the baby in a positive manner, the apparatus will encourage the strengthening of relatively weak sucking movements. The apparatus can be used to deliver a

controlled quantity of feed with an adjustable flow and allows for the sensitivity of response between mother and baby. Because of the use of the collapsible bag, the apparatus avoids the need for feed drawn from the apparatus to be replaced by air, as with a conventional solid bottle. Such air must be drawn from the baby's mouth back through the mouthpiece, may cause airlocks, and tends to cause the baby to open its mouth and so encourages the swallowing of air. All of this is avoided with the apparatus described and illustrated with respect to Figures 1 to 6.

The feeding bottle, generally indicated 100 in Figure 7 comprises a collapsible bag 110 mounted within an outer casing 140 suitably formed from a rigid plastics material or from glass. The wide mouth of casing 140 is provided with a closure in the form of bottle head 190 which is suitably formed of soft latex rubber or from a plastics material with similar properties and includes an integrally formed teat-end 200 suitably formed with a slit shaped self closing opening 201. A rigid or semi-rigid sleeve 300 slips over the mouthpiece 190 and the adjacent end of the casing 140.

Air enters the interior of casing 140 as bag 110 collapses via a non return valve 310 which may be integrally formed in the bottom of the bottle casing 140 as shown, or may be provided in a separate removable base adapted to fit the bottom of a generally cylindrical casing.

The open end of bag 110 may simply fit over the edge of the mouth of casing 140. Alternatively, and as preferred, bag 110 may be integral with or affixed to a generally rigid to semi-rigid collar 320 adapted to be located in the open mouth of casing 140 by means of locating beads such as 330.

Sleeve 300 has a window 340 which may be open or alternatively covered by flexible material. In either case the arrangement is such that the mother may apply pressure across the surface of the window to the underlying mouthpiece thereby forcing fluid through the slit shaped opening in the mouthpiece into the baby's mouth. Provision of the flexible material across the window sets the maximum value of the pressure which may be applied to the fluid.

A plurality of tactile indicia 350 are provided about the bottle head. It will be readily understood that when the baby's lips are essentially parallel to the longitudinal direction of the slit in the mouthpiece, the flow of feed will be minimized and that when the slit is turned through 90° so as to extend generally perpendicularly to the line of the baby's lips, the flow of feed will be maximized. Adjustment of the angular position of the bottle either by mother or baby can thus affect the rate of feed flow.

The feeding apparatus of Figures 8 and 9 illustrates an alternative arrangement utilizing a conventional wide necked infants' feeding bottle 400 of a kind in wide use in hospitals, for example. The bottle 400 has a wide mouthed opening 401 with an external screw thread. The apparatus further includes a mouthpiece 402 and a collar 403 adapted for mounting the mouthpiece 402 on the bottle 400. The rear end of mouthpiece 402 narrows to a neck 404 with a circumlocated flange 405, in a manner known *per se*. The inside of the collar 404 is provided with an inwardly directed flange 406 with a narrow circular opening for accommodating the neck 404. Collar 403 traps the flange 405 against the confronting lip surrounding mouth 401 in use.

The mouthpiece 402 has a teat end 407 provided with a slit opening similar to that in the embodiment of Figure 7. Integrally moulded into the material of mouthpiece 402, which is suitably formed of rubber or plastics material, are one or more one-way air valves 408.

This embodiment dispenses with the need for a collapsible bag and allows the use of conventional screw necked wide mouthed bottles. The orientation of the slit opening at the teat end 407 allows for some selection of the rate of feed as in the embodiment of Figure 7. The mother can regulate the rate of fow and the volume of each mouthful by pressure applied through one or more windows 409 formed in the collar in a fashion generally similar to the window 340 of the embodiment of Figure 7. As the baby sucks or as feed is manually expressed into the baby's mouth, air is introduced through the valve or valves 408. The mouthpiece has a generally bulbous shape. To overcome any difficulty in mounting the mouthpiece on the collar 403, the collar may be formed so as to separate into two halves or to have one portion hingedly mounted on the other. For a satisfactory arrangement, the collar must be capable of being rigidified, for example by use of an external elastic band thereabout.

The embodiments of Figures 10 to 13 may be seen as an improvement and modification of the arrangement of Figure 9 to overcome the difficulties in mounting the mouthpiece to the collar or in having the collar formed in two parts.

Using the same reference numerals for like parts, it will be seen that the feeding apparatus of Figures 10 to 13 similarly utilizes a conventional screw-necked widemouthed bottle 400. Internally threaded collar 410 is of somewhat different configuration, as best shown in Figure 11. The collar has an extension 411 which has a valley depression or cut-away part formed thereon which in the illustrated example is provided by the extension taking the shape of a right frustum with a segment removed along a plane parallel to the axis of the frustum, thereby defining a ledge 412 for a purpose to be explained. The mouthpiece 413 has a slit opening 407 at its teat end and one-way air valves 408 in like manner to the mouthpiece 402 of the embodiment of Figures 8 and 9. The major difference is that mouthpiece 413 makes an external liquid tight seal with collar 410. This seal may be provided in various ways. The mouthpiece may be adhered to the collar, may be elastically fitted by having a mouth of reduced diameter stretched and received into a circumferential groove formed in the exterior of the collar, or may be ultrasonically welded to the collar.

As in the embodiment of Figures 8 and 9, feed sucked through the mouthpiece by the baby or expressed by the mother (in a manner to be explained below) allows the introduction of air through valves 408 to equalize the pressure.

As will be apparent from Figure 12, the configura-

tion of collar extension 411 and in particular the provision of the ledge 412 leaves a space between the ledge and the adjacent surface of the mouthpiece. Manual pressure by the mother on this region of the mouthpiece will express a maximum volume of feed into the baby's mouth on each pressure stroke, the adjacent portion of the mouthpiece outer surface being pressed against the ledge as shown in Figure 13. The mother is, of course, enabled to regulate the feed rate, for example in time with the baby's attempted sucking reflex.

The various embodiments of feeding apparatus described and illustrated herein can transform feeding for mother and baby as compared with previously conventional feeding methods for babies with poor sucking ability and vomiting babies. Feeding can be a pleasurable experience for the baby enabling both mother and baby to relax. The flow of feed can be regulated to suit individual babies and varying thickness of feed. The actual intake of feed is readily measurable and waste due to spills is minimized. The resultant method can be achieved both in and out of the home environment and during the night. Feeding can be accomplished within a reasonable period of time. The equipment itself is easy to clean and to sterilize.

CLAIMS

1. A baby's feeding apparatus, comprising: a generally rigid generally cylindrical member defining a fixed volume; means allowing the introduction of a selected initial volume of feed within said fixed volume; a mouthpiece suitable for reception in a baby's mouth and being so configured as in use to allow passage therethrough of feed from said initial volume; means allowing the introduction of air into said fixed volume; and means controllable by the mother independently of the baby for regulating the flow of feed.

2. A baby's feeding apparatus according to Claim 1, wherein the said means whereby the mother may regulate the flow of feed independently of the baby is provided on said mouthpiece.

3. A baby's feeding apparatus according to Claim 1 or Claim 2, wherein the means allowing the introduction of air into said fixed volume is spaced from the said means whereby the mother may regulate the flow of feed independently of the baby.

4. A baby's feeding apparatus according to Claim 2 or Claim 3, wherein said mouthpiece includes a teat end adapted to be received in a baby's mouth in use and a region of sufficient extent and flexibility as to be palpable by hand by the mother, thereby to provide the said means whereby the mother may regulate the flow of feed independently of the baby.

5. A baby's feeding apparatus according to Claim 4, wherein said cylindrical member is closed at one end and said mouthpiece is mounted at its other end and wherein said means allowing the introduction of air comprises one or more air holes formed in said mouthpiece adjacent its mounting to the cylindrical member, said air holes being effectively closed when the mouthpiece is relaxed but being adapted to be pulled open to admit air therethrough as the result either of sucking by the baby or of palpating the said region by the mother.

6. A baby's feeding apparatus according to any of Claims 1 to 4, wherein said cylindrical member is closed at one end and said mouthpiece is mounted at its other end and wherein said means allowing the introduction of air comprises a valve formed in said generally cylindrical member.

7. A baby's feeding apparatus according to any preceding Claim, in which said initial volume is provided by filling a collapsible bag, said bag being mountable within said cylindrical member and being attachable to a nozzle in communication with said mouthpiece, whereby said bag collapses at a rate dependent on the rate of withdrawal of feed from said initial volume.

8. A baby's feeding apparatus, comprising: a generally rigid generally cylindrical member closed at one end and defining a fixed volume; means allowing the introduction of a selected initial volume of feed within said fixed volume; a mouthpiece suitable for reception in a baby's mouth and being so configured as in use to allow passage therethrough of feed from said initial volume, said mouthpiece being mounted at the other end of said cylindrical member; valve means allowing the introduction of air into said fixed volume whereby to equalize pressure therewithin as feed passes into the baby's mouth; and said mouthpiece comprising a teat end adapted to be received in a baby's mouth in use and a region of sufficient extent and flexibility as to be palpable by hand by the mother, whereby to provide a means controllable by the mother independently of the baby for regulating the flow of feed.

9. A baby's feeding apparatus according to Claim 8, wherein said mouthpiece is formed of a rubber or plastics material, said valve means is integrally moulded therein, and wherein said mouthpiece is coupled to said cylindrical member by means of a collar, said cylindrical member comprising a wide-necked infants' feeding bottle with an externally threaded opening at one end, said collar being internally threaded for threaded engagement with said threaded opening, and said collar having a cut away portion providing said region palpable by the mother.

10. A baby's feeding apparatus according to Claim 9, wherein said collar extends at least in part within said mouthpiece towards said teat end, which extension is provided with a valley, depression or cut-away portion whereby part of said extension is spaced from the adjacent wall of the mouthpiece providing the said palpable region; said extension part configuration defining a limiting maximum volume of feed delivered to the baby in each palpation.

11. A baby's feeding apparatus according to Claim 10, wherein the said extension has the configuration of a right frustum with a segment thereof cut away along a plane parallel to the axis of the frustum, whereby to define a ledge spaced from the adjacent wall of the mouthpiece providing the said palpable region, the configuration of the said ledge defining said limiting maximum volume of feed delivered to the baby in each palpation.

12. A baby's feeding apparatus substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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